



ALFa LDS: Autonomous, Low-Cost, Fast Leak Detection System

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ALFa LDS is an affordable, robust, autonomous system for the detection of natural gas leaks

Natural gas is used to heat our homes, cook our food and keep our lights on. The recent revolution in hydraulic fracturing has dramatically increased the availability of this clean-burning source of energy for the world.

But this increased production activity — spread over millions of miles of pipeline and thousands of processing facilities across the globe — brings with it costly, hard-to-detect leaks that threaten the “green” benefits that natural gas has the potential to deliver.

Enter ALFa LDS, the Autonomous, Low-cost, Fast Leak Detection System, pioneered by Los Alamos scientists in collaboration with Aeris Technologies and Rice University. ALFa LDS is an affordable, robust, autonomous system for the detection of natural gas leaks.

The technology works by feeding methane and ethane sensor data and atmospheric wind measurements into a simulation-trained artificial neural network that is then able to detect, locate and even quantify a leak. The featherweight platform is small enough to be deployed on a drone but powerful and intelligent enough to minimize fugitive leaks across the entire network of natural gas extraction, production and consumption.

The ALFa technology has three integrated components that operate in tandem for the detection, location and quantification of a natural gas leak. The three components are 1) a compact, low-cost laser methane and ethane sensor, 2) a mini 3D sonic anemometer and 3) a trained neural network code that pinpoints small leaks with high accuracy.

Prior to this approach, these individual components had been used independently in a sort of “ad hoc” method for leak detection by oil and gas service providers, for surveys by non-profits and for research by national laboratories and academia. However, the incorporation and integration of these three disparate components into one unified system is what makes ALFa so novel in its approach to leak detection technology and promises a revolution for each of these entities.

ALFa LDS outperforms competing leak detection technologies by an order of magnitude in its sensitivity to methane and ethane, at a fraction of the cost. Elements of this game-changing gas leak detection technology have broad applications for other criteria

pollutants — enabling portable, autonomous atmospheric surveys for a variety of contaminants.

The DOE Advanced Research Projects Agency-Energy (ARPA-E) and the Lab's Richard P. Feynman Center for Innovation - Technology Maturation Fund sponsored different stages of the project. The invention supports the Laboratory's Energy Security mission area through the detection of natural gas leaks.

[Watch a Lab video on the ALFa LDS technology.](#)

Los Alamos National Laboratory

www.lanl.gov

(505) 667-7000

Los Alamos, NM

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